

Excerpts from Anatomy of a Tree, Arbor Day Foundation

Excerpts used from the Arbor Day Foundation, Anatomy of a Tree. This information can be found at <http://www.arborday.org/trees/RingsTreeNatomy.cfm>

Scientific Explanations

The forest is a complex community where trees and other plants and animals live in delicate balance. As stewards of the earth's trees, it is helpful for us to know about the growth processes of trees, their role in the forest world, and how we can improve their quality. Trees are a renewable natural resource that can continue to provide beauty and useful products for generations to come. So how does a tree build a trunk that can live for centuries and hold the weight of many tons?

All of a tree trunk's growing is done in a thin layer of living cells, the cambium, which surrounds the wood. This layer creates new wood on one side of itself, and new bark on the other. This way, in effect, it moves outward, pushing the bark before it, leaving wood behind. Over the years the trunk of the tree becomes bigger and thicker as this process repeats itself each growing season. You'll see how a tree ring can tell you if the tree has lived through fires, lack of rain or too much rain, and much more. The marvelous chemistry of life tells this layer just how many wood cells will be needed to support the leafy crown, and how much bark to build in order to protect the wood beneath it. This process, infinitely repeated, has given the world its forests.

The Inside Story

The outer bark is the tree's protection from the outside world. Continually renewed from within, it helps keep out moisture from the rain, and prevents the tree from losing moisture when the air is dry. It insulates against cold and heat and wards off insect enemies.

The inner bark, or "phloem", is the pipeline through which food is passed to the rest of the tree. It lives for only a short time, then dies and turns to cork to become part of the protective outer bark.

The cambium cell layer is the growing part of the trunk. Each year it produces new bark and new wood in response to hormones that pass down through the phloem with food from the leaves. These hormones, called "auxins", stimulate growth in cells. Auxins are produced by leaf buds at the ends of branches as soon as they start growing in spring.

Sapwood is the tree's pipeline for water moving up to the leaves. Sapwood is new wood. As newer rings of sapwood are laid down, inner cells lose their vitality and turn to heartwood.

Heartwood is the central, supporting pillar of the tree. Although dead, it will not decay or lose strength while the outer layers are intact. A composite of hollow, needlelike cellulose fibers bound together by a chemical glue called lignin, it is in many ways as strong as steel. A piece 12" long and 1" by 2" in cross section set vertically can support a weight of twenty tons!